DETAILED ACTION

Response to Arguments

Applicant's arguments filed June 20, 2008 have been fully considered but they are not persuasive.

Applicant argues the combination of Li and Lindeberg fails to disclose "generating a plurality of differential operators for the selected region of interest, separate from the multi-dimensional dataset, using a discrete approximation of an analytic function". Applicant submits Li merely discloses classifying nodule candidates in a region of interest and filtering an entire set of image data and therefore cannot disclose or suggest “'isolating a selected region of interest from the multidimensional data set" (page 15). Applicant submits Li is silent with regard to segmentation (page 16, lines 11-13). Examiner respectfully disagrees.

Li clearly discloses performing segmentation of the lung regions (col. 12, lines 12-29). Li further discloses at least one of and preferably each of three multi scale enhancement filters are applied in parallel to lung region (col. 12, lines 30-34). The "region of interest" recited in Li (col. 12, lines 35-55) is not the element of Li that the examiner identified as corresponding to “isolating a selected region of interest from the multidimensional dataset". The segmentation of the lung regions disclosed by Li (col. 12, lines 12-29) corresponds to the claimed "isolating a selected region of interest" as it is the segmented lung region to which Li applies the multi scale enhancement filters (col. 12, lines 30-34). As such, the combination of Li and Lindeberg is not deficient in disclosure or suggestion of the claimed elements for which they are relied upon.

As to arguments with regard to the amendment further defining the steps included in isolating the selected region of interest, these elements were previously recited in claim 10 (now cancelled). Examiner identified the Hu reference disclosed isolating a pair of lungs including those steps in the previous Office action (pages 15-16). Applicant argues Li, Lindeberg and Hu are not combinable because Lindeberg and Hu teach away from the asserted combination. Applicant's arguments are drawn to computational requirements and efficiency, specifically, that use of the discrete approximations of an analytic function taught by Lindeberg reduces the computation requirements and improving efficiency. Applicant submits the additional steps of Hu requires additional computation and therefore the disclosures are opposite. Lindeberg and Hu are drawn to completely different elements and are combined with different elements of the Li reference. Lindeberg does not address isolating lung regions nor does Hu address discrete approximations of analytic functions or generating differential operators. Thus, Lindeberg and Hu cannot explicitly or implicitly teach away from one another. Therefore, a combination of Li, Lindeberg and Hu is not improper.

The above discussion is in response to applicant's arguments to claim 1. As applicant has not provided any further arguments with regard to claims 15, 16, 17, 18 or 19, beyond indicating they contain similar features, or claims 2-7, 11-12 and 14-21 beyond the basis of their dependency, argument presented above with regard to claim 1 are applicable to these claims as well.

Claim Objections

Claims 9 and 11 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 9 and 11 depend from claim 1. Claim 1 as currently amended already defines isolating a selected region of interest as including threshold filtering (filtering with a high threshold algorithm, filtering with a low threshold algorithm) and a morphological process (splitting…with a morphology erosion algorithm) configured to eliminate selected portions of the imaging volume.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-7, 9, 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,937,776 to Li et al. (hereafter referred to as "Li") in view of "Discrete Derivative Approximations with Scale-Space Properties: A Basis for Low-Level Feature Extraction" by Lindeberg and "Automatic Lung Segmentation for Accurate Quantitation of Volumetric X-Ray CT Images" by Hu et al. (hereafter "Hu").

Regarding claim 1, Li discloses a method for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 4, lines 59-67), the method comprising:

accessing the multi-dimensional dataset (col. 19, lines 29-40);

isolating a selected region of interest from the multidimensional dataset, said selected region of interest comprising a subset of the imaging volume (col. 12, lines 12-34, *segmentation of the lung regions*);

generating a plurality of differential operators for selected region of interest, separate from the multi-dimensional dataset, using an approximation of an analytic function (col. 7, line 11 – col. 10, line 37; col. 12, lines 30-67, *Li teaches generating the second order derivatives of the images and approximations to the second order derivatives and constructing a Hessian matrix*); and

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating (col. 6, line 10 – col. 7, line 32; col. 12, lines 30-67, *Li teaches geometric filters based on the second order derivatives*),

wherein isolating the selected region of interest further includes isolating lung tissue for a pair of lungs (Fig. 2; col. 12, lines 12-29).

Li discloses generating a plurality of differential operators for the multi-dimensional dataset using an approximation of an analytic function (col. 10, line 6-37) but does not explicitly disclose using a discrete approximation of an analytic function. However, Lindeberg clearly teaches using the discrete approximations of an analytic function (discrete derivative approximations) to determine the second order derivatives for use in a feature detector (Abstract; page 19, Section 6.1.3, second paragraph; page 16, Figure 3).

The teachings of Li and Lindeberg are combinable because they are both concerned with using filters derived from second order derivatives for feature extraction. It would have been obvious to one of ordinary skill in the art that the method taught by Li could be modified so the generating of a plurality of differential operators for the multi-dimensional dataset uses a discrete approximation of an analytic function as taught by Lindeberg because the discrete approximations can be computed directly from smoothed image values at different scales without the need for repeating the smoothing operation, thus reducing the computation requirements making it more efficient (Lindeberg, page 2, lines 32-41 (last full paragraph); page 12, section 4.1).

While Li discloses isolating a selected region of interest further includes isolating lung tissue for a pair of lungs comprising filtering with a threshold algorithm (col. 12, lines 12-29), Li does not explicitly disclose the further steps of isolating the selected region of interest as recited in claim 1.

Hu discloses a lung segmentation technique including:

filtering with a high threshold algorithm to isolate solid tissue and bone (page 491, Section A.1);

filling holes with a three-dimensional hole-filling algorithm to fill a portion of remain contained inside said solids (page 491, Section A.2);

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone (page 491, Section A.1);

splitting and isolating said pair of lungs with a morphology erosion algorithm (page 491-493, Section B);

closing and filing airways and vascular structures entering said pair of lungs with a morphology closure algorithm (page 493, Section C.1); and

filling remaining holes with a three-dimensional hole-filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest (page 494, Sections 4 and 5; Fig. 3).

The teachings of Li and Hu are combinable because they are both concerned with segmenting lung regions from CT images. It would have been obvious to one of ordinary skill in the art at the time the invention was made for the isolating of the region of interest taught by Li to include steps recited claim 1 and as taught by Hu so the automatic isolation/segmentation more closely mimics segmentation performed manually (page 493, Section C, second paragraph).

Regarding claim 2, Lindeberg further discloses scale-space processing the multi-dimensional dataset with multi-resolution sampling (page 25, section 7.1).

Regarding claim 3, Li further discloses iterating said generating and forming over several scales to determine said plurality of responses for each scale; and determining said plurality of geometric responses based on said iterating (Fig. 11; col. 11, lines 29-60).

Regarding claim 4, Li further discloses filtering the multi-dimensional dataset with a smoothing kernel based on an analytic function; said smoothing kernel generating a filtered multi-dimensional dataset (Fig. 11, S3; col. 10, line 46 – col. 11, line 60).

Regarding claim 5, Li further discloses said analytic function is a Gaussian (Fig. 11, S3; col. 10, line 46 – col. 11, line 60).

Regarding claim 6, Li further discloses said plurality of differential operators correspond to an n-th derivative of said analytic function, where n is greater than or equal to one (col. 7, line 11 – col. 11, line 60, Li teaches second derivatives.)

Regarding claim 7, the combination of Li and Lindeberg and Hu further discloses identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function. Lindeberg teaches identifying a plurality discrete approximations and Li teaches identifying approximations that when convolved with said analytic function, approximate an analytic derivative of said analytic function (see arguments and citations presented above for claim 1 and additionally Li, col. 10, line 38 - col. 11, line 7).

Li and Lindeberg are silent with regard to optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function. The Examiner takes Official Notice that optimization in a least squares sense is well known in the art and it would have been obvious to one of ordinary skill in the art to optimize the discrete derivative approximations in a least squares sense to reduce error between the discrete derivative approximations and the analytical derivative of the analytic function because optimization using

least squares techniques is exceedingly well known for quantifying and reducing differences (error) between two functions.

Regarding claim 11, Lindeberg further discloses generating a downsampled multidimensional dataset based on said multi-resolution sampling (page 25, Section 7.1).

Regarding claims 9 and 13, the combination of Li, Lindeberg and Hu further discloses said isolating a selected region of interest includes image threshold filtering and a morphology process configured to eliminate selected portions of the imaging volume (Hu, page 493-494, Section C; Li, col. 12, lines 12-29).

Regarding claim 12, Li further discloses isolating a selected region of interest from at least one of said multi-dimensional dataset and said downsampled multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume (col. 12, lines 12-29, Examiner notes the use of alternative language. Li teaches isolating a selected region of interest from the multi-dimensional dataset (segmenting the lung regions).).

Regarding claim 14, neither Li, Lindeberg nor Hu explicitly disclose said processing of a multi-dimensional dataset is executed in less than one minute, however one of ordinary skill in the art at the time the invention was made would have found it obvious that the processing taught by the combination of Li, Lindeberg and Hu, as presented above in the rejection of claim 1, is capable of being performed in less than one minute. If the presently claimed processing method

is capable of being performed in less than one minute, because the combination of Li, Lindeberg and Hu disclose the same steps, then the processing method taught by the combination of Li, Lindeberg and Hu would also be performed in less than one minute when performed by an equivalent processing apparatus/computer.

Regarding claim 15, Li discloses a method for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 4, lines 59-67).

Li does not disclose processing the multidimensional dataset with multi-resolution sampling to establish a downsampled multidimensional dataset, however Lindeberg discloses multi-resolution sampling to establish a downsampled multidimensional dataset (page 25, section 7.1). One of ordinary skill in the art at the time the invention was made would have been motivated to modify the method taught by Li to include multiresolution sampling to establish a downsampled multidimensional dataset as taught by Lindeberg in order to improve computational efficiency (Lindeberg, page 25, section 7.1, first paragraph).

Li further discloses identifying a region of interest from the multi-dimensional dataset; said region of interest comprising a subset of the imaging volume (col. 12, lines 12-34),

wherein identifying a region of interest further includes isolating lung tissue for a pair of lungs (col. 12, lines 12-34).

In view of the modification to the method of Li to include sampling the multi-resolution sampling as taught by Lindeberg is would have further been obvious to one of ordinary skill in the art to process said downsampled multidimensional dataset based on said region of interest

and establishing a multi-dimensional datasubset in view of Li's teaching of establishing a datasubset based on a region of interest (col. 12, lines 12-34).

Li further discloses filtering the a multi-dimensional datasubset, separate from the multi-dimensional dataset, with a smoothing kernel based on an analytic function; said smoothing kernel generating a filtered multi-dimensional datasubset (Fig. 11, S3; col. 10, line 46 – col. 11, line 60).

Li also discloses generating a plurality of differential operators for the multi-dimensional datasubset using an approximation of an analytic function (col. 10, line 6-37) but does not explicitly disclose using a discrete approximation of an analytic function. However, Lindeberg teaches using the discrete approximations of an analytic function (discrete derivative approximations) to determine the second order derivatives for use in a feature detector (Abstract; page 19, Section 6.1.3, second paragraph; page 16, Figure 3). It would have been obvious to one of ordinary skill in the art that the method taught by Li could be modified so the generating of a plurality of differential operators for the multi-dimensional dataset uses a discrete approximation of an analytic function as taught by Lindeberg because the discrete approximations can be computed directly from smoothed image values at different scales without the need for repeating the smoothing operation, thus reducing the computation requirements making it more efficient (Lindeberg, page 2, lines 32-41 (last full paragraph); page 12, section 4.1).

Li further discloses forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating (col. 6, line 10 – col. 7, line 32).

While Li discloses isolating a selected region of interest further includes isolating lung tissue for a pair of lungs comprising filtering with a threshold algorithm (col. 12, lines 12-29), Li

does not explicitly disclose the further steps of isolating the selected region of interest as recited in claim 15.

Hu discloses a lung segmentation technique including:

filtering with a high threshold algorithm to isolate solid tissue and bone (page 491, Section A.1);

filling holes with a three-dimensional hole-filling algorithm to fill a portion of remain contained inside said solids (page 491, Section A.2);

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone (page 491, Section A.1);

splitting and isolating said pair of lungs with a morphology erosion algorithm (page 491-493, Section B);

closing and filing airways and vascular structures entering said pair of lungs with a morphology closure algorithm (page 493, Section C.1); and

filling remaining holes with a three-dimensional hole-filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest (page 494, Sections 4 and 5; Fig. 3).

The teachings of Li and Hu are combinable because they are both concerned with segmenting lung regions from CT images. It would have been obvious to one of ordinary skill in the art at the time the invention was made for the isolating of the region of interest taught by Li to include steps recited claim 15 and as taught by Hu so the automatic isolation/segmentation more closely mimics segmentation performed manually (page 493, Section C, second paragraph).

Regarding claim 16, Li discloses a method for processing of a multi-dimensional dataset (col. 4, lines 59-67). Li does not disclose processing the multi-dimensional dataset in a multi-resolution framework. However, Lindeberg discloses multi-resolution sampling of a multidimensional dataset (page 25, section 7.1). One of ordinary skill in the art at the time the invention was made would have been motivated to modify the method taught by Li to include multiresolution process the multi-dimensional dataset in a multi-resolution framework as taught by Lindeberg in order to improve computational efficiency (Lindeberg, page 25, section 7.1, first paragraph).

Li further discloses isolating a selected region of interest from said multidimensional dataset and establishing a multidimensional datasubset, said selected region of interest comprising a subset of the imaging volume (col. 12, lines 12-34),

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs (col. 12, lines 12-29);

convolving said multidimensional datasubset, separate from the multi-dimensional dataset, with an analytic function to obtain a first convolution product (Fig. 11; col. 10, line 46 – col. 11, line 60); and

determining a plurality of derivative approximations to an analytic function (col. 10, line 6-37).

Li does not explicitly disclose determining a plurality of discrete derivative approximations to an analytic function. However, Lindeberg clearly teaches using the discrete approximations of an analytic function (discrete derivative approximations) to determine the

second order derivatives for use in a feature detector (Abstract; page 19, Section 6.1.3, second paragraph; page 16, Figure 3). It would have been obvious to one of ordinary skill in the art that the method taught by Li could be modified to include determining a plurality of discrete derivative approximations to an analytic function as taught by Lindeberg because the discrete approximations can be computed directly from smoothed image values at different scales without the need for repeating the smoothing operation, thus reducing the computation requirements making it more efficient (Lindeberg, page 2, lines 32-41 (last full paragraph); page 12, section 4.1).

Li and Lindeberg are silent with regard to optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function. The Examiner takes Official Notice that optimization in a least squares sense if well known in the art and it would have been obvious to one of ordinary skill in the art to optimize the discrete derivative approximations in a least squares sense to reduce an error between the discrete derivative approximations and the analytical derivative of the analytic function because optimization using least squares techniques is exceedingly well known for quantifying and reducing differences (error) between two functions.

The combination of Li and Lindeberg further discloses convolving said first convolution product with the plurality of discrete approximations of partial derivatives of an analytic function to create a plurality of second convolution products (Li, Fig. 11; col. 10, line 46 – col. 11, line 60);

forming a plurality of Hessian matrices from said plurality of second convolution products (Li, Fig. 11; col. 11, line 44 – col. 12, line 11);

determining a plurality of eigenvalue decompositions for said plurality of said Hessian matrices (col. 9, line 63 – col. 10, line 5); and

combining eigenvalues resultant from said decompositions to represent spherical and cylindrical responses to elements of said multidimensional datasubset (Li, col. 6, line 10 – col. 9, line 62).

While Li discloses isolating a selected region of interest further includes isolating lung tissue for a pair of lungs comprising filtering with a threshold algorithm (col. 12, lines 12-29), Li does not explicitly disclose the further steps of isolating the selected region of interest as recited in claim 16.

Hu discloses a lung segmentation technique including:

filtering with a high threshold algorithm to isolate solid tissue and bone (page 491, Section A.1);

filling holes with a three-dimensional hole-filling algorithm to fill a portion of remain contained inside said solids (page 491, Section A.2);

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone (page 491, Section A.1);

splitting and isolating said pair of lungs with a morphology erosion algorithm (page 491-493, Section B);

closing and filing airways and vascular structures entering said pair of lungs with a morphology closure algorithm (page 493, Section C.1); and

filling remaining holes with a three-dimensional hole-filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest (page 494, Sections 4 and 5; Fig. 3).

The teachings of Li and Hu are combinable because they are both concerned with segmenting lung regions from CT images. It would have been obvious to one of ordinary skill in the art at the time the invention was made for the isolating of the region of interest taught by Li to include steps recited claim 16 and as taught by Hu so the automatic isolation/segmentation more closely mimics segmentation performed manually (page 493, Section C, second paragraph).

Regarding claim 17, Li further discloses a system for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 4, lines 59-67; col. 18, lines 37-44), the system comprising:

a means for accessing the multi-dimensional dataset (col. 18, lines 37-44; col. 19, lines 29-40);

a means for isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume(col. 18, lines 37-44; col. 12, lines 12-34)

a means for generating a plurality of differential operators for selected region of interest, separate from the multi-dimensional dataset, using an approximation of an analytic function (col. 18, lines 37-44; col. 7, line 11 – col. 10, line 37; col. 12, lines 30-67); and

a means for forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating (col. 18, lines 37-44; col. 6, line 10 – col. 7, line 32; col. 12, lines 30-67),

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs (col. 12, lines 12-29).

Li discloses generating a plurality of differential operators for the multi-dimensional dataset using approximations of an analytic function (col. 10, line 6-37) but does not explicitly disclose using a discrete approximation of an analytic function. However, Lindeberg clearly teaches using the discrete approximations of an analytic function (discrete derivative approximations) to determine the second order derivatives for use in a feature detector (Abstract; page 19, Section 6.1.3, second paragraph; page 16, Figure 3).

The teachings of Li and Lindeberg are combinable because they are both concerned with using filters derived from second order derivatives for feature extraction. It would have been obvious to one of ordinary skill in the art that the system taught by Li could be modified so the generating of a plurality of differential operators for the multi-dimensional dataset uses a discrete approximation of an analytic function as taught by Lindeberg because the discrete approximations can be computed directly from smoothed image values at different scales without the need for repeating the smoothing operation, thus reducing the computation requirements making it more efficient (Lindeberg, page 2, lines 32-41 (last full paragraph); page 12, section 4.1).

While Li discloses isolating a selected region of interest further includes isolating lung tissue for a pair of lungs comprising filtering with a threshold algorithm (col. 12, lines 12-29), Li

does not explicitly disclose the further steps of isolating the selected region of interest as recited in claim 17.

Hu discloses a lung segmentation technique including:

filtering with a high threshold algorithm to isolate solid tissue and bone (page 491, Section A.1);

filling holes with a three-dimensional hole-filling algorithm to fill a portion of remain contained inside said solids (page 491, Section A.2);

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone (page 491, Section A.1);

splitting and isolating said pair of lungs with a morphology erosion algorithm (page 491-493, Section B);

closing and filing airways and vascular structures entering said pair of lungs with a morphology closure algorithm (page 493, Section C.1); and

filling remaining holes with a three-dimensional hole-filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest (page 494, Sections 4 and 5; Fig. 3).

The teachings of Li and Hu are combinable because they are both concerned with segmenting lung regions from CT images. It would have been obvious to one of ordinary skill in the art at the time the invention was made for the isolating of the region of interest taught by Li to include steps recited claim 17 and as taught by Hu so the automatic isolation/segmentation more closely mimics segmentation performed manually (page 493, Section C, second paragraph).

Regarding claim 18, Li discloses a system for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 4, lines 59-67), the system comprising:

an imaging system comprising;

a radiation source configured to generate a radiation beam incident upon an object,

a radiation detector, said radiation detector configured to receive an attenuated radiation beam responsive to said radiation beam incident upon said object and produce an electrical signal responsive to an intensity of attenuated radiation beam, and

wherein said radiation source and said radiation detector disposed about an object cavity.

Li discloses the multi-dimensional dataset can be obtained from an X-ray CT apparatus (col. 19, lines 29-31; col. 12, lines 12-34). The above limitations are inherent to a conventional X-ray CT apparatus being used to image an object.

Li further discloses a processing device in operable communication with said radiation detector configured to execute a method for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 18, lines 37-44; col. 19, lines 29-40), the method comprising;

accessing the multi-dimensional dataset (col. 19, lines 29-40),

isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume (col. 12, lines 12-34),

generating a plurality of differential operators for selected region of interest, separate from the multi-dimensional dataset, using an approximation of an analytic function (col. 7, line 11 – col. 10, line 37; col. 12 , lines 30-67), and

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating (col. 6, line 10 – col. 7, line 32; col. 12, lines 30-67),

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs (col. 12, lines 12-29).

Li discloses generating a plurality of differential operators for the multi-dimensional dataset using an approximation of an analytic function (col. 10, line 6-37) but does not explicitly disclose using a discrete approximation of an analytic function. However, Lindeberg clearly teaches using the discrete approximations of an analytic function (discrete derivative approximations) to determine the second order derivatives for use in a feature detector (Abstract; page 19, Section 6.1.3, second paragraph; page 16, Figure 3).

The teachings of Li and Lindeberg are combinable because they are both concerned with using filters derived from second order derivatives for feature extraction. It would have been obvious to one of ordinary skill in the art that the method taught by Li could be modified so the generating of a plurality of differential operators for the multi-dimensional dataset uses a discrete approximation of an analytic function as taught by Lindeberg because the discrete approximations can be computed directly from smoothed image values at different scales without the need for repeating the smoothing operation, thus reducing the computation requirements making it more efficient (Lindeberg, page 2, lines 32-41 (last full paragraph); page 12, section 4.1).

While Li discloses isolating a selected region of interest further includes isolating lung tissue for a pair of lungs comprising filtering with a threshold algorithm (col. 12, lines 12-29), Li

does not explicitly disclose the further steps of isolating the selected region of interest as recited in claim 18.

Hu discloses a lung segmentation technique including:

filtering with a high threshold algorithm to isolate solid tissue and bone (page 491, Section A.1);

filling holes with a three-dimensional hole-filling algorithm to fill a portion of remain contained inside said solids (page 491, Section A.2);

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone (page 491, Section A.1);

splitting and isolating said pair of lungs with a morphology erosion algorithm (page 491-493, Section B);

closing and filing airways and vascular structures entering said pair of lungs with a morphology closure algorithm (page 493, Section C.1); and

filling remaining holes with a three-dimensional hole-filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest (page 494, Sections 4 and 5; Fig. 3).

The teachings of Li and Hu are combinable because they are both concerned with segmenting lung regions from CT images. It would have been obvious to one of ordinary skill in the art at the time the invention was made for the isolating of the region of interest taught by Li to include steps recited claim 18 and as taught by Hu so the automatic isolation/segmentation more closely mimics segmentation performed manually (page 493, Section C, second paragraph).

Regarding claim 19, Li discloses a computer data storage device, said computer data storage device including computer readable program code, the computer readable program code comprising a method for processing of a multi-dimensional dataset corresponding to an imaging volume (col. 18, line 45 – col. 19, line 20). Regarding the method, arguments analogous to those presented above for claim 1 are applicable to claim 19.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY MACKOWEY whose telephone number is (571)272-7425. The examiner can normally be reached on M-F 9:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C Bella/
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10/26/08